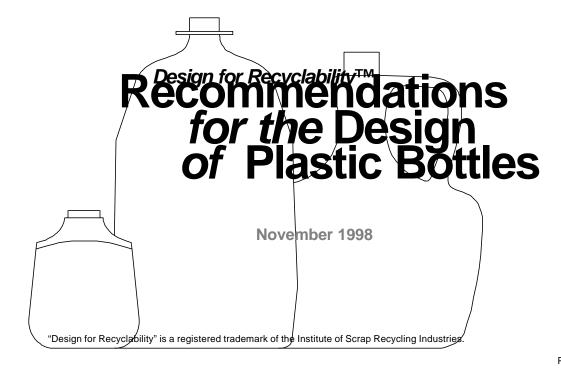
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the PLASTIC REDESIGN PROJECT



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a technical matter, but also, whether it increases the cost of processing for the majority of reclaimers, or lowers the scrap value of the material processed, when the new bottle is recycled.

If it does either, they should redesign the composition or configuration of the container, or develop alternative techniques to achieve equivalent performance and appearance, that will not have these negative impacts on recycling. In evaluating the impact on recycling, the bottle should be tested at the proportion of the new package in the process stream that would exist if it were adopted in all bottles for that application in the market segment in which it is sold, not at the smaller proportion that would exist at its initial launch. • Also, if new designs present new processing considerations, the designer should develop a "cookbook" to assist reclaimers to improve processing conditions.

Existing Bottles. Firms selling product in existing plastic bottles, other than the most commonly recycled HDPE and PET resins, should first reevaluate whether that type of bottle can be recycled as a technical matter. If the bottle cannot be recycled, alternatives that can should be pursued instead. • If the bottle can be recycled as a technical matter, firms should also determine whether the bottle increases the cost of processing for the majority of reclaimers, or lowers the scrap value of the material processed,

relative to the cost to process or scrap value of the commonly recycled bottle designs. • Where the existing bottle does increase the cost or lower the value to recyclers relative to commonly used alternatives, firms should either use those common alternatives or redesign the composition or configuration of the container that achieve equivalent performance and appearance, if the cost of doing so is not substantially more than the processing cost or lower value to recyclers from not doing so.

The Bottle Only distinct resin types can be marketed to high paying end markets, and, of amongst them, unpigmented varieties command higher prices because they are more versatile in their applications.

- Natural HDPE bottles should not be pigmented.¹
- PET bottles should not be pigmented or tinted a color other than green and should instead achieve equivalent effects with graphics on labels which have a specific gravity less than one and is applied with a dispersible adhesive.
- Base cups should not be used on PET bottles.
- All layers in multi-layered plastic bottles should be sufficiently compatible so that the PCR can be sold into high value end markets without incurring higher processing costs.²

Some dairies have moved to pigment their natural HDPE one gallon milk bottles white or yellow. One of the reasons put forward for pigmentation is because of concerns that light might cause damage to the flavor or vitamin content of the milk. However, a review of the published technical literature on the subject shows that, while light damage can be demonstrated in the laboratory with sufficient duration and wattage, there is no field research to demonstrate whether this concern extends to real-world conditions. Another reason that has been generally acknowledged by industry observers for pigmentation of one-half and one gallon bottles is as a marketing stratagem. The Plastic Redesign Project recommends that were light damage shown to exist in real-world conditions, remediation be accomplished by yellow lights or filters in the supermarket shelf instead of pigmentation and otherwise not be used.

At the time these recommendations were written, except for test markets beer was not yet sold in plastic bottles, such a multi-layer plastic bottle, in the U.S., and this limited the development of a comprehensive design principle for beer applications in plastic. At least three vendors are offering container designs that are aimed at providing sufficient shelf life for beer to be packaged in PET or PET variant bottles. These include polyethylene naphthalate (PEN)

- PVC is disfavored in bottles for products that are also packaged in bottles made of other resins that look like PVC such as PET.
- PET bottles for which handles are desired and that are used in market segments which represent a significant proportion of PET applications, such as the 2 liter carbonated beverage market, should not require the use of material which is incompatible with, or increases the cost to process, or lowers the market value, of the PET stream at the proportion of the new package in the process stream that would exist if it were a success and adopted by other companies for the application in that market segment.

copolymers, PET layered with ethylene vinyl alcohol (EVOH) or nylon, and barrier coatings. Various representations have been made for each as to their impact on recycling, but none have been made generally available for independent validation at this time. Beer producers are requested to ask vendors to demonstrate whether they can comply with the General Design Principles and only work with those vendors which can. In addition, beer producers considering packaging in a plastic bottle that is tinted a color other than green are requested to only do so if the color is applied just to the surface of the bottle and can be readily removed during processing without additional cost and without bleeding, or otherwise be accomplished with a label that has a specific gravity less than one and has a dispersible adhesive.

nonsumers leave caps on about ½ of the Caps, Closures and Seals Ubottles they recycle. Although, some of those caps fall off during collection and

processing, many wind up as a contaminant in the reground material. In the PET stream, caps can be simply floated off in inexpensive sink/float tanks, but the task is more complicated, ineffective and costly in the HDPE stream.

-Caps, closures and spouts on HDPE bottles (except living hinge applications) should compatible that the SO postconsumer resin (PCR) can be marketed into high value end uses (such as film and bottle markets) without the need manually remove caps during processing.³

- —Caps on natural HDPE bottles should not be pigmented. Where needed, colored labels should be used for product differentiation instead of pigmenting the cap.
- —Aluminum caps should be phased out on plastic bottles.
- —Aluminum seals on plastic bottles are not preferred unless the seal pulls completely off by the consumer.

The Project has just completed Environmental Stress Crack Resistance and Bruceton Drop tests using ASTM standards to determine whether there are any adverse impacts on homopolymer and copolymer HDPE bottles from cap contamination at 4% levels by weight from PP with melt flows of 2 and 20, HDPE with melt flows of 0.4 and 25 and LDPE with a melt flow of 25. (Cap contamination in recycled bottles regrind is generally considered to be less than 2% by weight.). The conclusion from the test is that there is no adverse impact from such cap contamination. End users are asked to advise their bottle molders that provide them with recycled bottles to accept recovered resin that includes cap residues within these parameters as a less costly alternative to redesigned cap material or molding processes. Copies of the test results are available on request by calling 608/231-1100.

Decorations, Labels and Adhesives While most labels are either readily blown off in an air

curtain or washed away during processing, some labels use adhesives that are very difficult to remove and some decorative techniques bleed onto the flake.

- Adhesives on labels, including those on refrigerated bottles, should be water dispersible during processing or avoided by using shrink or snap on wraps.¹
- Decoration should be encouraged to be made so that the pigments do not "bleed"

from the label during the reclamation process.²

- Metallized labels should not be used on plastic bottles if the specific density of the bottle is greater than 1.0.
- Printing should not be directly applied on unpigmented packaging containers, except for date coding.
- PVC and PVDC film labels should only be used on PVC containers.

One recent label strategy for milk bottles eliminates the need for using any adhesive, while providing a label that remains firmly secure regardless of condensation. This involves the use of a snap-on LDPE label in conjunction with a modified bottle side wall for which the mold contains an indentation for the label to be inset where it will not be subject to slippage. One supplier of these labels is MRI Packaging, and a dairy/molder which molds such bottles is Garelick Farms. The Plastic Redesign Project provides this example to be illustrative of how to meet the performance specification only and does not intend for the example to be prescriptive. The Project provides these company names to facilitate implementation only and does not make product endorsements. Other vendors with the same or alternative means to meet the performance recommendation are requested to inform the Project so that they can be added to this note.

New packages are presently considering the use of heat transfer labels. These forms of labels typically bleed, and increase processing costs which is disfavored.

the Plastic Redesign Project

The PLASTIC REDESIGN PROJECT is funded by the US Environmental Protection, with additional financial support from California, New York and Wisconsin. Its goal is to promote designs for plastic bottles that meet product manufacturers performance and appearance specifications for the packages that their product is sold in — but which, at the same time, do not impede cost-efficient recycling of the package after it is discarded by the consumer. To find win/win design solutions for recyclers and packagers, in Phase I the cities of Dallas, Jacksonville, Milwaukee, New York, San Diego and Seattle worked with Avery Dennison, Johnson Control, Owens Illinois, Procter & Gamble, SC

Johnson Wax, and St. Jude Polymer to develop 13 consensus recommendations. In Phase II, 32 states' recycling officials are participating in a joint effort to work with product manufacturers to implement the design recommendations. The states are Arizona, California, Colorado, Connecticut, Delaware, Florida, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, Nevada, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Texas, Vermont, Wisconsin, Wyoming.

: Advice Available

Designers are urged to consult with the Association of Postconsumer Plastic Recyclers (APR) for advise, testing protocols and full-scale wash lines for commercial tests. Information about APR's Champion's for Change program is available by calling 202/974-5419.

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